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**ABSTRACT**

From Ayurveda's ancient knowledge comes the idea of *Vrana*, which looks deeply into how wounds heal and the body's unique ability to fix itself. "*Vrana*" refers to ulcers or wounds in today's scenario. If not appropriately treated, wounds can convert into "*Dushta Vrana*", i.e infectious or complicated wounds. Ayurvedic texts explain how to manage *Dushta Vrana* precisely, and people have been using many formulations for centuries to address these issues. Wound healing is a delicate and vital process valued by both ancient and modern medicine." With the growing interest in alternative therapies, Ayurvedic wound healing management is gaining popularity. *Kutaja* (*Holarrhena antidysenterica*) is a notable herbal medicine recognized for its numerous wound-healing properties. *Kutaja* (*Holarrhena antidysenterica*), in particular, is packed with various helpful compounds such as coumarins, ergosterol, flavonoids, phenolic acids, resins, saponins, steroidal alkaloids, tannins, and triterpenoids.

**Keywords:** *Vrana*, *Shodhana*, *Ropana*, *Kutaja*, Wound healing**INTRODUCTION**

In Ayurveda, "दोषैरधिष्ठितो दुष्टः" signifies that a *Dushta Vrana* (infected or chronic wound) is caused and worsened by imbalances in the body's *Doshas*. Addressing these imbalances is essential for effective

wound healing. To achieve optimal healing, it is essential to remove as much impurity as possible through *Shodhana* (cleansing) and *Vrana Ropana* (wound healing promotion procedures). In *Sushruta Samhita*,

specifically in *Sutrasthana Dravyasanghraniya Adhyaya*, 37 *Ganas* are described, including the *Aragwadhadi* and *Lakshadi Gana*, both of which possess *Dushta Vrana Vishodhan* property<sup>2</sup>. These *Ganas* are recognized for their effectiveness in purifying and promoting the healing of wounds, emphasizing their role in wound management. Their natural extracts often show impressive effectiveness, can be surprisingly affordable, and typically come with minimal side effects compared to some conventional drugs. One such plant attracting interest is *Kutaja* (*Holarhena antidysenterica*), known by names like Tellicherry Bark, *Kurchi*, *Vatsaka*, *Kalinga*, and more. The plant *Holarhena antidysenterica*, commonly known as *Kutaja*, and its seeds, *Indrajava*, are found in tropical and subtropical regions of Asia and Africa. It is abundant in India, especially in the Himalayan ranges. Over the last few Varieties of *Kutaja* mentioned in classical texts of Ayurveda are described below;

➤ <i>Puma Kutaja</i> ➤ <i>Stri Kutaja</i>	<i>Charak Samhita</i> <sup>4</sup>
➤ <i>Sita</i> ➤ <i>Asita</i>	<i>Raj Nighantu</i> <sup>5</sup>

### Classical Texts

In *Charak Samhita*<sup>6</sup> it is mentioned under *Kandughna mahakashaya* and also included in *Arshoghna*, *Stan-yashodhana*, and *Asthapanopaga Mahakashaya*.

In *Sushruta Samhita*<sup>7</sup>, *Kutaja* is classified under the *Aragwadhadi Gana* and other groups like *Pippalyadi*, *Haridradi*, and *Lakshadi Gana*. According to Acharya *Sushruta*, the primary actions of the *Aragwadhadi Gana* are *Sleshmahara* (reduce *Kapha Dosha*), *Kush-tahara* (treat skin diseases), *Kandughna* (relieve itching) and *Vrana Shodhana* (wound cleansing). On the other hand, *Lakshadi Gana* is particularly noted for its role as *Kushtaghana* (reducing skin disorders) and *Dushta Vrana Vishodhana* (cleansing chronic wounds).

In *Ashtanga Hrudya*<sup>8</sup>, it is described under *Aragwadhadi Gana*, where its actions are described as *Kaphaghana*, *Kandughana*, and *Dushtavrana Vishodhna*.

years, scientists found various phytochemical compounds that have been isolated from the plant and shown the traditional pharmacological activities as it contains a diverse range of phytochemicals, including coumarins, ergosterol, flavonoids, phenolic acids, resins, saponins, steroidal alkaloids, tannins, and triterpenoids which had antibacterial, analgesic, anti-inflammatory, anti-diarrhoeal, anti-oxidant/free radical scavenging, antimicrobial, and anti-MRSA (Methicillin-Resistant *Staphylococcus aureus*) and wound healing activities.

**Synonyms of *Kutaja***<sup>3</sup> – *Kutaja*, *Kootaja*, *Kauta*, *Vatsaka*, *Girimallika*, *Kalinga*, *Shakrashakhi*, *Mal-likapushpa*, *Indra*, *Indravriksha*, *Yavaphala*, *Vrikshaka*, *Panduradruma*.

### Nighantu

*Bhavaprakasha*<sup>9</sup>- *Haritakyadi Varga*, *Guduchyadi Varga*

*Dhanwantari Nighantu*<sup>10</sup>- *Shatapushpadi Varga*

*Raja Nighantu*<sup>11</sup>-*Prabhadradi Varga*

*Ashtanga Nighantu*<sup>12</sup>-*Vatsakadi Gana*

*Nighantu Adarsha*<sup>13</sup>- *Kutajadi Varga*

*Madanapala Nighantu*<sup>14</sup>- *Abhayadi Varga*

*Kaiyadeva Nighantu*<sup>15</sup>- *Aushadi Varga*

*Priya Nighantu*<sup>16</sup>-*Haritakyadi Varga*

*Shodala Nighantu*<sup>17</sup>- *Shatapushpadi Varga*

*Vrindha Madhava*<sup>18</sup>- *Atisara Adhikara*, *Kushtadhikara*, *Arsho Adhikara*

### Ras- Panchak<sup>19</sup>

*Rasa Tikta*, *Kashaya*

*Guna* -*Laghu*, *Ruksha*

*Veerya* -*Sheeta*

*Vipaka*-*Katu*

*Dosha karma*-*Kapha-Pitta* -*Shamak*

**Part used** -Stem Bark

**External application** -It acts as *Vrana -Ropak*

### **MODE OF ACTION**<sup>20,21</sup>

#### **1. Vrana-Ropana**

In Ayurvedic terms, *Vrana-Ropana* is one of the primary functions of *Kashaya Rasa*. The *Ruksha* quality helps remove excess moisture (*Kleda*) and oiliness (*Snigdhtaa*) from the wound site, which can slow the healing process. By reducing the moisture the *Kashaya Rasa* supports tissue regeneration and helps close the wound effectively. Furthermore, the *Guru* and *Sheeta* properties of *Kashaya Rasa* assist in tissue regeneration. The *Guru Guna* promotes stability and supports the building and binding of tissues, while the *Sheeta Guna* provides a cooling effect and soothes inflammation and irritation. These qualities help repair and bind torn tissues together more effectively, leading to faster recovery when moisture is reduced.

#### **2. Upshoshana**

*Kashaya Rasa* (astringent taste) absorbs wound exudate through its *Ruksha* (drying) and *Stambhana* (constricting) properties. The *Ruksha Guna* removes excess moisture (*Kleda*) from the wound, while the *Stambhana* quality helps contract tissues, reducing fluid buildup and accelerating healing and tissue regeneration. Together, these properties create an optimal environment for wound closure and faster recovery.

#### **3. Rakta-Shodhaka and Rakta-Sthambhak**

Since *Kashaya Rasa* already acts as a *Rakta-Shodhaka* (blood purifier), helping to remove impurities from the **Steroidal Alkaloids** (around 2% of bark):

S.No	Name of Alkaloids	Pharmacological properties
1.	Conkurchine	Anti-inflammatory and anti-nociceptive properties.
2.	Flavonoids	Anti-oxidant and anti-inflammatory properties.
3.	Phenolic acids	Anti-oxidant and antimicrobial properties.
4.	Triterpenoids	Anti-inflammatory and anti-cancer properties
5.	Tannins	Astringent and wound healing properties.
6.	Coumarins	Anticoagulant and anti-inflammatory properties.

Thus far, various alkaloids have been isolated from multiple segments of *Holarrhena antidysenterica*, which are detailed below.

bloodstream, and it supports the overall healing of the wound by ensuring that the blood circulating in the area is free of toxins and impurities and as blood is essential for delivering the nutrients and oxygen necessary for tissue regeneration, further speeding up the healing process.

In addition to purifying the *Rakta*(blood), it also acts as a *Rakta-Stambhak*, which helps prevent excessive bleeding or other imbalances within the blood.

#### **4. Twak Prasadana**<sup>22</sup>

*Kashaya Rasa* can enhance skin health by eliminating excess oil (*Snigdhatata*) and moisture (*Kleda*) from the body, it helps maintain a balanced and healthy skin condition. When substances with *Kashaya Rasa* are applied to skin (*Twacha*), they can improve skin complexion, texture, and clarity by removing oiliness and reducing damp, sticky qualities that make the skin appear unhealthy. Its ability to dry up excess moisture and balance *Kapha* and *Pitta Doshas* makes it an essential tool in Ayurvedic treatments for wounds, skin conditions, and overall blood health.

### **CHEMICAL CONSTITUENTS**<sup>23</sup>

The primary chemical components identified in *Holarrhena antidysenterica* are predominantly located in the stem, bark, leaves, and, to a lesser extent, in the seeds. The major constituents encompass steroidal alkaloids, flavonoids, triterpenoids, phenolic acids, tannins, resins, coumarins, saponins, and ergosterol. However, the most studied and potentially beneficial components are found in the bark:

**Alkaloids in Stem Bark: -**

S.No	Chemical compounds	S.No	Chemical compounds
1.	(20)-N-Methylholarrhimine [C <sub>22</sub> H <sub>38</sub> N <sub>2</sub> O]	25.	Kurchenine [C <sub>21</sub> H <sub>32</sub> N <sub>2</sub> O <sub>2</sub> ]
2.	(3)-N-Methylholarrhimine [C <sub>22</sub> H <sub>38</sub> N <sub>2</sub> O]	26.	Kurchessine [C <sub>25</sub> H <sub>44</sub> N <sub>2</sub> ]
3.	3a-Aminoconan-5-ene [C <sub>22</sub> H <sub>36</sub> N <sub>2</sub> ]	27.	Kurchilidine [C <sub>22</sub> H <sub>31</sub> NO]
4.	7 $\alpha$ -Hydroxyconessine [C <sub>24</sub> H <sub>40</sub> N <sub>2</sub> O]	28.	Kurchimine [C <sub>22</sub> H <sub>36</sub> N <sub>2</sub> ]
5.	Conamine [C <sub>22</sub> H <sub>36</sub> N <sub>2</sub> ]	29.	Kurchinidine [C <sub>21</sub> H <sub>29</sub> NO <sub>2</sub> ]
6.	Conessidine [C <sub>21</sub> H <sub>32</sub> N <sub>2</sub> ]	30.	Kurchinine [C <sub>19</sub> H <sub>24</sub> O <sub>3</sub> ]
7.	Conkurchine [C <sub>20</sub> H <sub>32</sub> N <sub>2</sub> ]	31.	Kurchollessine,
8.	Conkurchinine [C <sub>25</sub> H <sub>36</sub> N <sub>2</sub> ],	32.	Lettocine [C <sub>17</sub> H <sub>25</sub> NO <sub>2</sub> ]
9.	Di-hydro-isoconessimine [C <sub>23</sub> H <sub>40</sub> N <sub>2</sub> ]	33.	Neoconessine (isomer of conessine) [C <sub>24</sub> H <sub>40</sub> N <sub>2</sub> ],
10.	Holacetine [C <sub>21</sub> H <sub>32</sub> N <sub>2</sub> O <sub>3</sub> ]	34.	NNN'N'-Tetramethylholarrhimine [C <sub>25</sub> H <sub>44</sub> N <sub>2</sub> O]
11.	Holacine [C <sub>26</sub> H <sub>44</sub> N <sub>2</sub> O <sub>2</sub> ],	35.	Norholadiene [C <sub>21</sub> H <sub>29</sub> NO],
12.	Holadiene [C <sub>22</sub> H <sub>31</sub> NO],	36.	Pubadysone [C <sub>21</sub> H <sub>26</sub> O <sub>3</sub> ]
13.	Holadysenterine [C <sub>23</sub> H <sub>38</sub> N <sub>2</sub> O <sub>3</sub> ]	37.	Pubamide [C <sub>21</sub> H <sub>27</sub> NO <sub>3</sub> ]
14.	Holadysone [C <sub>21</sub> H <sub>28</sub> O <sub>4</sub> ]	38.	Pubescimine [C <sub>24</sub> H <sub>40</sub> N <sub>2</sub> O],
15.	Holafrine [C <sub>29</sub> H <sub>46</sub> N <sub>2</sub> O <sub>2</sub> ]	39.	Pubescine [C <sub>22</sub> H <sub>26</sub> N <sub>2</sub> O <sub>4</sub> ]
16.	Holarrhenine [C <sub>24</sub> H <sub>40</sub> N <sub>2</sub> O]	40.	Puboestrene [C <sub>20</sub> H <sub>24</sub> O <sub>3</sub> ]
17.	Holarrhessimine [C <sub>22</sub> H <sub>36</sub> N <sub>2</sub> O]	41.	Regholarrhenine A [C <sub>22</sub> H <sub>31</sub> NO <sub>2</sub> ],
18.	Holarrhidine [C <sub>21</sub> H <sub>36</sub> N <sub>2</sub> O]	42.	Regholarrhenine B [C <sub>21</sub> H <sub>29</sub> NO <sub>2</sub> ]
19.	Holarrhimine/Kurchicine [C <sub>21</sub> H <sub>36</sub> N <sub>2</sub> O]	43.	Regholarrhenine C [C <sub>22</sub> H <sub>34</sub> N <sub>2</sub> ],
20.	Holarrhine [C <sub>20</sub> H <sub>38</sub> N <sub>2</sub> O <sub>3</sub> ]	44.	Regholarrhenine D [C <sub>23</sub> H <sub>38</sub> N <sub>2</sub> O]
21.	Holarrifine [C <sub>24</sub> H <sub>38</sub> N <sub>2</sub> O <sub>2</sub> ],	45.	Regholarrhenine E [C <sub>25</sub> H <sub>44</sub> N <sub>2</sub> O <sub>2</sub> ]
22.	Holonamine	46.	Regholarrhenine F [C <sub>25</sub> H <sub>44</sub> N <sub>2</sub> O],
23.	Kurchamide		
24.	Kurchamine [C <sub>22</sub> H <sub>36</sub> N <sub>2</sub> ]		

**Alkaloids from Leaves: -**

S.No	Chemical compounds	S.No	Chemical compounds
1.	Holarosine A [C <sub>30</sub> H <sub>47</sub> NO <sub>6</sub> ]	7.	Holantosine-A [C <sub>28</sub> H <sub>47</sub> NO <sub>6</sub> ]
2.	Holarosine B [C <sub>30</sub> H <sub>47</sub> NO <sub>6</sub> ]	8.	Holantosine-B [C <sub>28</sub> H <sub>45</sub> NO <sub>5</sub> ],
3.	Holarricine [C <sub>21</sub> H <sub>32</sub> N <sub>2</sub> O <sub>3</sub> ]	9.	Holantosine-C [C <sub>28</sub> H <sub>47</sub> NO <sub>6</sub> ]
4.	Holantosine-D [C <sub>28</sub> H <sub>45</sub> NO <sub>5</sub> ]	10.	Holantosine-E [C <sub>28</sub> H <sub>47</sub> NO <sub>6</sub> ],
5.	Holantosine-F [C <sub>28</sub> H <sub>45</sub> NO <sub>5</sub> ],	11.	Kurchiphyllamine,
6.	Kurchaline	12.	Kurchiphylline [C <sub>23</sub> H <sub>47</sub> NO <sub>2</sub> ]. <sup>27</sup>

**Alkaloids from Seeds: -**

S.No	Chemical compounds
1.	Antidysenteric [C <sub>23</sub> H <sub>36</sub> N <sub>2</sub> O]
2.	Conimine [C <sub>22</sub> H <sub>36</sub> N <sub>2</sub> ]

**Alkaloids from both Stem Bark and Seeds: -**

S.No	Chemical compounds
1.	Conessine (C <sub>24</sub> H <sub>40</sub> N <sub>2</sub> ),
2.	Isoconessine (C <sub>24</sub> H <sub>40</sub> N <sub>2</sub> )
3.	Conessimine/Isoconessimine (C <sub>23</sub> H <sub>38</sub> N <sub>2</sub> ),
4.	Conarrhimine (C <sub>21</sub> H <sub>34</sub> N <sub>2</sub> )

**Solubility in different mediums** 24,25

The stem bark of *Holarrhena antidysenterica* contained more water—and methanol-soluble extractives (23.33%, 28.45%). Distilled water had the highest extractive value (13.72%). Another study revealed that alcoholic and aqueous extracts of *Holarrhena antidysenterica* stem bark had antibacterial activity against ten enteric pathogens at a dosage of 200 mg/ml.

**PHARMACOLOGICAL PROPERTIES**<sup>26,27,28,29</sup>

**1. Antimicrobial and Antibacterial:** *Kutaja* bark is rich in various alkaloids, including conjestimine, holarrhenine, and curine. These alkaloids exhibit potent antibacterial activity against both Gram-positive and Gram-negative bacteria. Tannins and saponins found in *Kutaja* bark offer another layer of antibacterial defence. They interact with bacterial cell walls, causing protein precipitation and cell death. Phenolic Compounds and Flavonoids: -These antioxidant powerhouses scavenge free radicals and exhibit bacterial growth inhibition properties. Their synergistic action with other antibacterial compounds in *Kutaja* enhances its overall effectiveness

**2. Anti-inflammatory and analgesic:** Studies show that *Kutaja* bark extracts, sterols, and flavonoids possess anti-inflammatory properties, reducing inflammation around the wound site. This reduces pain, swelling, and tissue damage, facilitating faster healing. The methanolic bark extract of *Holarrhena antidysenterica* demonstrated decreased nitric oxide and malondialdehyde levels and increased levels of superoxide dismutase and glutathione levels in 2,4-Dinitrobenzene sulfonic acid-induced colitis in male

albino Wistar rats. The rats also resisted rupture of goblet cells, inflammation in mucosal layers, and inflammatory cellular infiltration.

**3. Antioxidant:** *Kutaja* contains various antioxidant compounds, such as phenolic acids and flavonoids. These compounds scavenge free radicals and protect tissues from oxidative damage, promoting wound healing and reducing scarring.

**4. Wound healing:** Several studies have demonstrated the wound-healing potential of *Kutaja* bark extracts. They stimulate collagen synthesis, fibroblast proliferation, and angiogenesis (new blood vessel formation), which is essential for proper wound repair.

**5. Anti-MRSA:** Ethanolic bark extracts from *Holarrhena antidysenterica* demonstrated an inhibition zone against methicillin-resistant *Staphylococcus aureus* (MRSA). This property helps prevent and control bacterial infections in wounds and promotes healing.

**6. Multidrug-Resistant Acinetobacter Baumannii (MDRAB):** *Holarrhena antidysenterica* (*Kutaja*) is investigated for its effects against Multidrug-Resistant *Acinetobacter Baumannii* (MDRAB). *Kutaja* appears to be a resistant modifier for *Acinetobacter Baumannii*. The possible action of *Holarrhena antidysenterica* extract is that it weakens the outer membrane and interrupts its permeability in the case of *A. Baumannii*. *Holarrhena antidysenterica* is a resistance modifying agent against *Acinetobacter baumannii* and affects bacterial outer membrane permeability and efflux pumps.

**CONCLUSION**

In Ayurveda, *Dushta Vrana* (chronic or infected wound) is caused by imbalances in the *Doshas*, leading to delayed healing. It addresses these imbalances with proper wound care, including *Shodhana* and *Vrana Ropana* drugs, which are essential for healing. Among the traditional herbs used for treating *Dushta Vrana*, *Kutaja* (*Holarrhena antidysenterica*) holds significant importance, particularly its antimicrobial, anti-inflammatory, antioxidant, and wound-healing properties. Classical Ayurvedic texts, such as *Sushruta Samhita* and *Ashtanga Hrudaya*, classify *Kutaja* under *Aragwadhadi Gana* and emphasize its ability to purify wounds and treat skin diseases. Modern research supports these traditional uses, showing that the bark of *Kutaja* contains powerful phytochemicals like steroidal alkaloids, flavonoids, tannins, and triterpenoids, which exhibit antibacterial, antioxidant, and wound-

healing activities. These properties, especially its effectiveness against MRSA and multidrug-resistant *Acinetobacter baumannii*, make *Kutaja* a valuable herb in treating infected wounds and chronic conditions. Its ability to cleanse wounds, promote collagen synthesis, and support tissue regeneration highlights its role in wound healing.

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